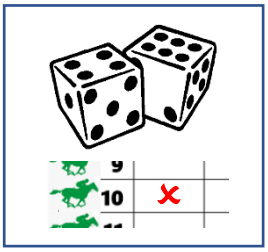
# Off to the Races

Probability is used in various fields including meteorology, insurance and economics. But for now, let's just have some fun with it!

**Materials Needed** Race track game board and graphs (printable)
Outcomes of Rolling Two Dice (printable)
A pair of dice or an online simulator such as https://www.geogebra.org/m/UsoH4eNl

**Procedure**




Let's race some horses!

Roll a pair of dice or use the link to simulate it.
Add the numbers shown on the two dice.
Advance that number horse one space on your game board.
Roll again and repeat the process until you have a winner.

Wait a minute! One of the horses needs to be scratched (withdrawn from the race)! He can't even advance one square! Which horse would that be? _____

Why? _____

It's time to place your bets. Which horse do you think will win?_____

Now were ready…horses are in the gate…CLANG! And they're off!

Which horse was your winner?_____

Was your prediction correct? _____

When people bet on horseracing, they use a lot of background statistics to increase their odds of winning. Although rolling the dice to determine a winner seems random, if we consider how the horses advance, we could have made a fairly safe guess as to which one would win.

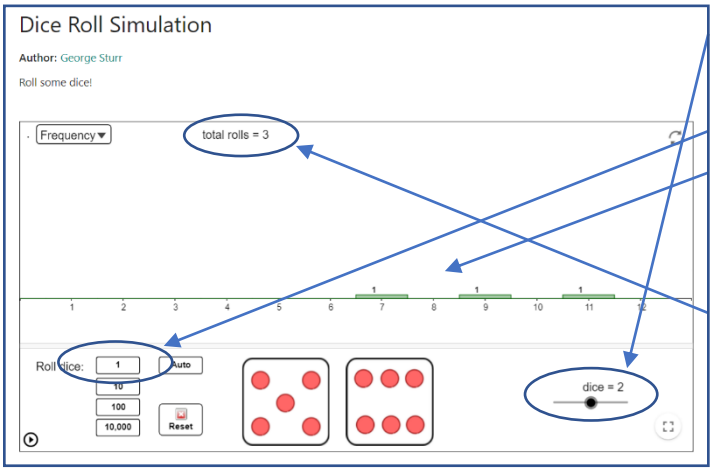
Take a look at the diagram that pictures all the possible outcomes of rolling two dice. Total the numbers on each outcome, then graph the frequency of each sum on the bar graph titled "The Outcomes of Rolling Two Dice".

You thought you were just playing a game? You were actually creating a bar graph of your own results! Compare the results on your racetrack game board to your bar graph. It might help to cut the racetrack off and turn it 90° counterclockwise.

What do you notice?_____

Why do you think your race turned out the way it did, compared to what the bar graph showed?_____

_____




Use this link to simulate rolling two dice.
https://www.geogebra.org/m/UsoH4eNl

Notice as you continue to click on the 1, the software builds a bar graph for you.

Continue clicking on the 1 until the bar graph on the web page is the same shape as the bar graph that you made. How many times did you have to roll the dice to get that same **shape**? _____

The reason we study probability is because it allows us to predict the outcome of an event without having to repeat that event hundreds, even thousands, of times. Theoretical probability is based on outcomes in a perfect universe and can be calculated using the following formula:

The Theoretical Probability of an Event

$$P(event) = \frac{number\ of\ desireable\ outcomes}{number\ of\ possible\ outcomes}$$

Calculate the probability of each horse winning using your dice diagram and this formula.

Example: Horse #7 $p(sum\ of\ 7) = \frac{6\ ways\ to\ get\ a\ sum\ of\ 7}{36\ possible\ ways\ 2\ dice\ can\ land} = \frac{1}{6} =$ .17 (rounded to the nearest hundredth)

Horse #2 = _____

Horse #3 = _____

Horse #4 = _____

Horse #5 = _____

Horse #6 = _____

Horse #7 = .17

Horse #8 = _____

Horse #9 = _____

Horse #10 = _____

Horse #11 = _____

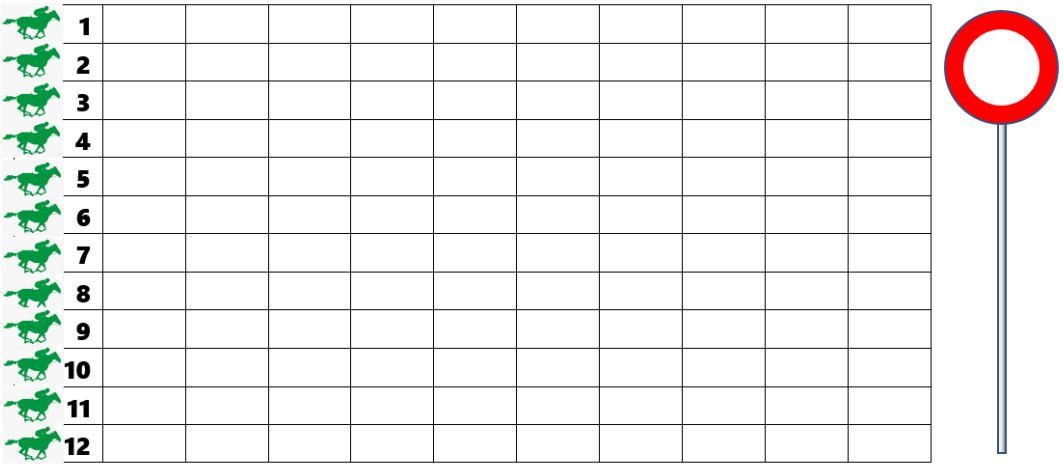
Horse #12 = _____

Make a bar graph of these results on the third graph titled "Probability of Wins".

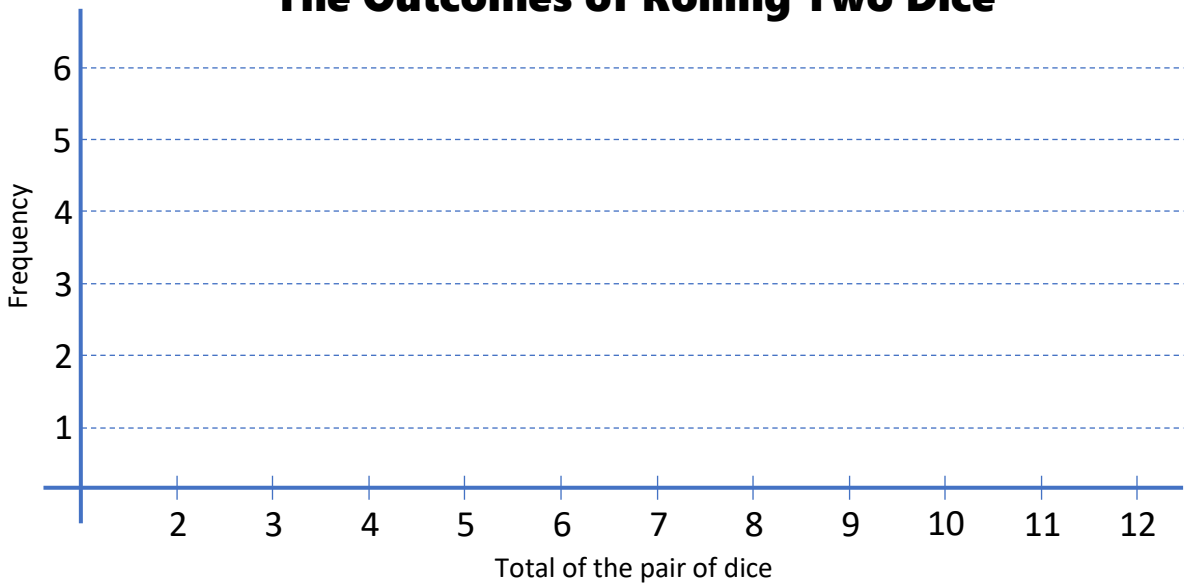
Compare "Sums of the Outcomes of Rolling Two Dice" with" Probability of Wins". What do you notice?

_____

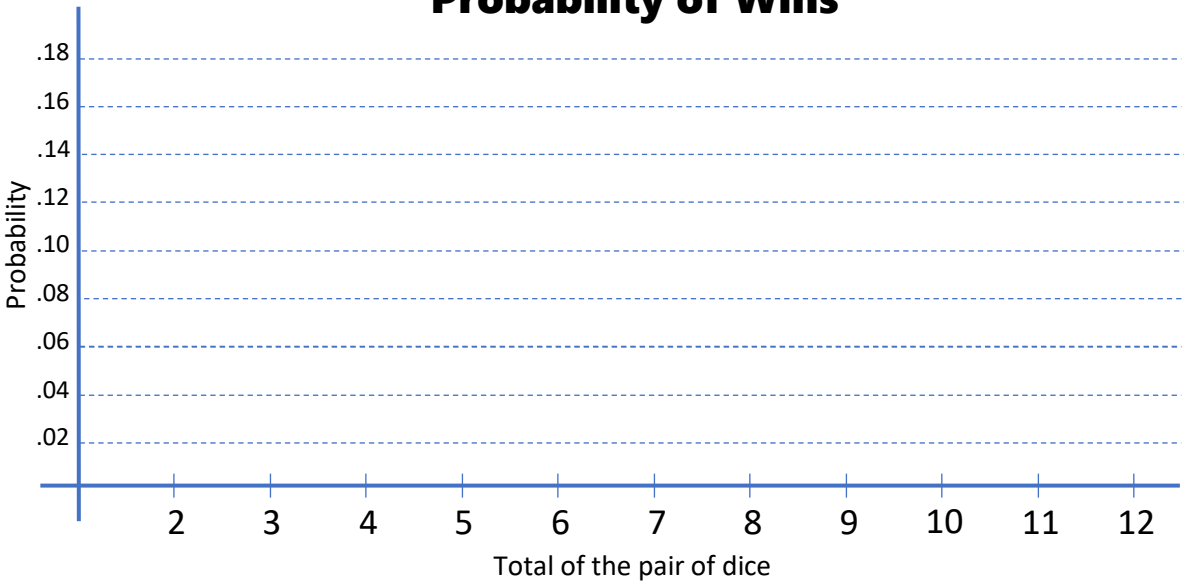
# RACETRACK GAME BOARD




## The Outcomes of Rolling Two Dice




## Probability of Wins



# Outcomes of Rolling Two Dice